

Southern California Wetlands Recovery Project

Wetlands Managers Group Report

May 18, 2001

Regional Strategy

Following up on last October's symposium, the Wetlands Managers Group has been working to draft the *WRP Regional Strategy and 5-Year Implementation Plan*, as called for in the Working Agreement. The long-term vision of the WRP is to reestablish a mosaic of functioning wetland and riparian systems that supports a diversity of fish and wildlife species. The purpose of the Regional Strategy is to define a set of overarching goals to guide the efforts of the Wetlands Recovery Project and its partner organizations towards achieving this vision. The regional goals will provide a framework for setting policies and priorities for acquisition and restoration projects. This framework can be used by all of the partners of the WRP – at the federal, state, and local level – to ensure that individual wetlands projects are part of a comprehensive and coordinated recovery effort.

A preliminary draft of the Strategy is now under review. The outline of the document is as follows:

Chapter 1: Introduction

- Purpose and Need for the Regional Strategy
- Background on the Wetlands Recovery Project

Chapter II: Existing and Historical Conditions

- General Overview
- Subregional Summaries

Chapter III: Related Regional Planning Efforts

Chapter IV: WRP Goals and Priorities

- Regional Goals
- Subregional Priorities
- Research and Management Needs

Chapter V: 5-Year Implementation Strategy, *bound separately and updated as needed*. This chapter will be drafted after completion of main document.

Appendix: Summary of existing conditions by watershed.

Chapter IV outlines the WRP's regional and subregional goals, and is really the heart of the document. The preliminary draft of this chapter is attached for your review. The Regional

Strategy is being developed based on currently available information and knowledge. The WRP Science Advisory Panel is working on a related effort to identify and fill data gaps in order to develop more detailed, quantifiable objectives. The Regional Strategy will be revised as this information is developed.

Due to the length of the document, the Managers Group recommends preparing an Executive Summary version of the Regional Strategy that would be more widely distributed. Full versions of the document would be distributed to all of the state and federal partners and posted to the WRP website. Limited copies of the full document would also be available to the public in hard copy, possibly for a fee.

The success of the Wetlands Recovery Project lies not only in the working partnership of the state and federal agencies, but also in the buy-in and commitment of our local partners – municipalities, environmental organizations, and the business community. For this reason, it is critical to involve the public – and in particular the WRP Task Forces – in development of the Regional Strategy. The Managers Group has outlined the following schedule for reviewing, revising, and completing the Strategy:

- Post draft Regional Strategy to the WRP web page. Send notice to WRP email list (approximately 950 people) requesting comments. (June 2001-July 2001)
- Work with 5 County Task Forces to discuss Strategy, particularly County-level priorities and description of existing conditions. (June 2001-July 2001)
- Compile comments provided by Managers Group members from their respective agencies; comments should address how Regional Strategy can be incorporated into partner agency policies and programs. (June 2001-July 2001)
- Create and/or collect maps, figures, and photos to augment the text. (June-August 2001)
- Revise Regional Strategy. (August 2001)
- Prepare revised draft of the Regional Strategy. (September 2001)
- Present Regional Strategy to Governing Board for consideration and approval at the October Symposium (October 2001)

Regional Goals – Summary of Discussion

I. Goal 1: Preserve and restore coastal wetlands.

- A. Statement of Need
 - 1. Habitat loss
 - 2. Altered ecosystems processes
 - 3. Continued development pressures
 - 4. Rarity of coastal wetlands
- B. Key Strategies and Priorities
 - 1. Preservation
 - (1) Preserve wetlands primarily in private ownership
 - (2) Expand preserved wetland and associated upland habitats at sites primarily in public ownership
 - 2. Restoration
 - (1) Restore diversity and quality of habitat types (refer to Goal 3)
 - (2) Restore ecosystem functions (tidal connection and circulation, remove fill)
 - (3) Address watershed issues affection wetland (inputs of sediment, freshwater, invasive species, water quality contaminants)

II. Goal 2: Preserve and restore stream corridors in coastal watersheds.

- A. Statement of Need
 - 1. Habitat loss
 - 2. Altered ecosystem functions
 - (1) Hydrology
 - (a) Increased rate and quantity of flood flows
 - (b) Increased freshwater in system due to imported water
 - (c) Changed timing of flows – increased dry season flows
 - (2) Altered sediment flows
 - (a) Sediment trapped by dams
 - (b) Increased erosion and sedimentation
 - (c) Reduced scour of estuaries and bays
 - 3. Decreased water quality
- B. Key strategies and priorities
 - 1. Preserve and restore riparian and aquatic habitat, including by reducing hardscape.
 - 2. Reconnect creek and river corridors with their floodplains
 - 3. Restore sediment transport functions (remove dams, stabilize banks and channels, in environmentally-sensitive ways)
 - 4. Address water quality issues

III. Goal 3: Recover habitat and species diversity.

- A. Statement of Need
 - 1. Habitat loss
 - 2. Listed species
- B. Key Strategies and Priorities
 - 1. Restore a diversity of habitat types within individual wetlands (focus on larger wetlands)

2. Employ a multi-species approach.
3. Preserve and restore surrounding upland and dune habitat.
4. Preserve and restore habitat linkages and fish and wildlife corridors.

IV. Goal 4: Advance the science of wetlands restoration in Southern California.

A. Statement of Need

1. More research needed on
 - (1) Restoration processes and practices
 - (2) Optimizing monitoring programs, including developing regional monitoring standards

B. Key Strategies and Priorities

1. Promote research on wetland ecology, restoration science, and specific issues affecting the success of wetlands restoration in Southern California.
 - (1) Integrate research into restoration designs
 - (2) Extramural SAP research program
2. Promote development of more effective, cost-efficient monitoring programs
3. Disseminate information

V. Goal 5: Promote education related to coastal wetlands and coastal watersheds

A. Statement of Need

1. WRP cannot achieve goals without support of the public.
2. Educate decision makers to today and tomorrow.

B. Key Strategies and Priorities

1. Develop compatible public access
2. Integrate interpretive programs into projects
3. Promote opportunities for experiential learning (i.e., volunteer labor)
4. Promote development of education materials and activities

VI. Goal 6: Integrate wetlands recovery with other public objectives.

A. Statement of Need

1. Other objectives may work at odds to wetlands recovery

B. Key Strategies and Priorities

1. Promote an integrated approach with federal, state, and local partner agencies to incorporate wetlands considerations into planning for other types of projects.
2. Promote wetlands projects with multiple objectives.

IV. Goals and Priorities

The Southern California Wetlands Recovery Project is a partnership of state and federal agencies working in concert with local governments, environmental organizations, and the business community to develop and implement a regional strategy for the acquisition, restoration, and enhancement of coastal wetlands and coastal watersheds. The long-term vision of the Wetlands Recovery Project is to reestablish a mosaic of fully functioning wetlands systems with a diversity of habitat types and connections to upland communities that preserves and recovers self-sustaining populations of species. The WRP has identified six regional goals that will guide its efforts:

1. Preserve and restore coastal wetlands.
2. Preserve and restore stream corridors and wetlands in coastal watersheds.
3. Recover habitat and species diversity.
4. Advance the science of wetlands restoration in Southern California.
5. Promote education and compatible access related to coastal wetlands and watersheds.
6. Integrate wetlands recovery with other public objectives.

These goals along with key strategies for achieving them are discussed below. One of the next steps in the WRP's regional planning effort will be to work with the Science Advisory Panel to identify quantitative objectives to measure progress towards the regional goals. In pursuing preservation of coastal wetlands and watersheds, the WRP may employ a variety of mechanisms, including acquisition of property by public agencies or through partnerships with private conservation organizations, acquisition of conservation easements, or implementation of best management practices. The WRP relies on a non-regulatory approach and will only acquire property from willing sellers. Following the regional goals, more specific priorities and information needs are identified for each County. Lastly, specific research and management priorities are also outlined in this chapter.

A. Regional Goals

Goal 1: Preserve and restore coastal wetlands.

Statement of Need

Southern California's coastal wetlands are among the most productive habitats on the Pacific Coast. The wetlands provide habitat for hundreds of fish and wildlife species, including feeding and nesting habitat for migratory birds on the Pacific Flyway and habitat and food chain support for commercial and recreational fisheries. As discussed in Chapter 2, Southern California's coastal wetlands have been severely impacted by human activity, with only about 25 percent, or roughly 15,000 acres, of the historic coastal wetlands remaining. Portions of many coastal wetlands were filled for agricultural or urban development. Oil extraction facilities have been erected in several coastal wetlands. In others, ponds have been created for salt extraction, sewage treatment, or duck hunting purposes. In those areas where wetlands habitat remains, urban

development has typically reduced, degraded, or eliminated the surrounding upland habitat that is a critical part of the wetland ecosystem. The loss of wetlands habitat has left several species struggling to survive.

In addition to providing critical habitat for plants and animals, coastal wetlands also filter sediments and nutrients from the watershed, serve as groundwater recharge zones and buffers when flooding occurs, and produce material that fuels both aquatic and terrestrial food chains. Losses of coastal wetlands in Southern California, as well as the degraded state of those remaining, have greatly reduced the natural functions in the landscape.

The dramatic reduction of water quality functions in coastal wetlands severely impairs the quality of one of Southern California's most valuable resources: its coastal waters. Wetlands detoxify contaminants, filter bacteria, and remove and transform nutrients that enter into streams and rivers from urban and agricultural development. The loss of wetlands in coastal watersheds has contributed to deteriorating water quality in beaches, coastal lagoons and bays, and the marine environment. The decline in water quality in these areas ultimately affects the revenue that California earns from tourism and commercial fisheries.

The natural hydrology of the coastal wetlands has been greatly modified. Water is imported into the region for urban and agricultural use, and the discharge of this water as wastewater effluent and non-point source flows has changed the quantity as well as the seasonal pattern of freshwater discharge to the coast. These changes have resulted in the disturbance of the natural habitats in coastal wetlands, stressing native plant and animal communities and allowing for the invasion of opportunistic exotic species. Tide gates, diking, roadway construction, and coastal developments have greatly restricted natural tidal connections, resulting in reduced tidal prisms. This reduces the natural scouring in creek channels and coastal lagoons and bays, and further exacerbates the problems of infilling of these areas caused by increased sedimentation from upstream sources.

Development pressures continue to impact the region's coastal wetlands. Supporting upland habitat continues to be lost and corridors that link coastal wetlands to upstream habitats are quickly disappearing. Wetlands created in upland areas to mitigate coastal wetland loss from development often do not have the same ecological functions as those that were destroyed. Filled areas that were historically part of a coastal wetland can potentially be restored to wetland; however, these areas may not be fully protected under state and federal wetlands statutes and could be lost if not acquired. Hydrologic and land use changes in the coastal watersheds also continues to impact downstream wetlands.

Tidal wetlands in Southern California are small and relatively scarce, particularly in comparison to tidal wetlands along the east and gulf coasts. This was true even historically. Tidal wetlands are a transitional habitat between terrestrial and marine environments, and can only be established within a small elevation range and a compatible geologic setting. The region's rugged topography and actively uplifting coastline limits the establishment of tidal wetlands. This, combined with extensive coastal development, restricts opportunities for restoring or creating tidal wetlands in Southern California. Given the limited opportunities, preservation and restoration of any potential tidal wetland sites is a high priority.

Key Strategies and Priorities

- A. Preserve coastal wetlands. The WRP has two main strategies for preservation of coastal wetlands:
- Preserve coastal wetlands that are primarily privately-owned, and not subject to any conservation guarantees. At a regional planning meeting in 1997, the Science Advisory Panel identified several priority sites for acquisition, including the Oxnard Plain, Ballona Wetlands, Los Cerritos Wetlands, and the Huntington Beach/Santa Ana River Mouth wetlands complex.
 - Expand the preserved wetland and associated upland habitats at sites that are already primarily in public (or conservation) ownership.
- B. Restore coastal wetlands. Wetlands restoration in Southern California encompasses a broad range of activities, from small enhancement efforts to large-scale reconstruction of wetlands systems. Significant changes in land use, watershed hydrology, and site topography limit the extent to which historic conditions can be feasibly restored. In many cases, restoration will involve creating a functioning wetland system, but not re-creating the historic conditions. For the Wetlands Recovery Project, restoration is viewed broadly to include any efforts that increase the quantity or quality of coastal wetland habitat in the region. Priority areas for restoration that have been identified by the WRP Science Advisory Panel include Tijuana Estuary, South San Diego Bay, San Elijo Lagoon, Buena Vista Lagoon, and Carpinteria Salt Marsh. Once acquired, the priority acquisition sites discussed above would become priority sites for restoration. Key concerns for restoration of coastal wetlands include:
- Restore diversity and quality of wetland habitat types (see Goal #3 for discussion)
 - Restore ecosystem functions, including hydrology and water quality functions
 - Address watershed issues affecting the wetlands, including inputs of sediment, freshwater, invasive species, and water contaminants.

Goal 2: Preserve and restore stream corridors and wetlands in coastal watersheds.*Statement of Need*

Many of the creeks and rivers in Southern California's coastal watersheds have been significantly altered as a result of agricultural and urban development over the past 100 years. Dams were built in the upper watersheds for water storage, flood control, and hydroelectric purposes. Creek and river systems have been highly engineered with channels moved, confined to concrete, and placed underground. Extensive urban development has replaced native vegetation with concrete. The ever-increasing population has spurred the import of water from a variety of sources – fundamentally changing the region's hydrologic landscape. Human activities have generated billions of pounds of contaminants, much of which has ended up in the region's

waterways. These changes have severely degraded the habitat, ecosystem functions, and water quality of the region's stream corridors.

The confinement and hardscaping of Southern California's creeks and rivers has led to substantial losses of the region's floodplain, riparian, and aquatic habitats. Faber et al. (1989) estimated that 90-95 percent of the riparian community has been lost. Some systems, such as the Los Angeles River, have been almost completely disconnected from their floodplain and denuded of nearly all riparian habitat. Several species that rely on these habitats are listed as species of concern, including the least Bell's vireo, steelhead trout, red-legged frog, and arroyo toad. Historically, migratory birds also used this habitat, but now face population declines due to overcrowding and disease. Riparian corridors often function as linkages between larger habitat areas. Loss of these movement corridors has contributed to fragmentation of the remaining wildlife habitat in the region. Invasive species such as *Arundo donax* have also reduced riparian and aquatic habitat.

Urban and agricultural development in Southern California coastal watersheds has also significantly altered other natural stream functions, including water quality, hydrology, and sediment transport functions. Water quality impairments include both non-toxic elements such as increased sediment flows, nutrients, and water temperatures, as well as toxic contaminants such as pesticides and heavy metals. The loss of wetland habitat throughout the coastal watersheds has exacerbated the water quality problems, since wetlands can improve water quality by removing or sequestering many contaminants. The degraded water quality affects fish and wildlife habitat quality, and limits recreational use of Southern California beaches, bays, and lagoons.

Hydrologic patterns in Southern California watersheds have been altered by many different factors. Thousands of square miles of the region have been paved, increasing the quantity and speed of storm water runoff. The loss of floodplains in many watersheds has exacerbated this effect. Dry weather irrigation of both agricultural and urban areas increases dry-season flows in the region's creeks and rivers. Many streams that were previously intermittent now flow year round. Base flows have also increased due to the significant amount of water imported into the region. Conversely, in some systems water diversions and groundwater pumping have depleted base flows. Today, the Santa Ana River, which drains the largest watershed in Southern California, rarely flows to the ocean due to diversions for groundwater recharge.

Sediment flows in coastal streams have also changed. In some cases, dams in the upper watersheds create barriers to sediment transport, thereby reducing sand replenishment to beaches and dunes. In other cases, increased storm runoff due to urbanization results in increased channel and bank erosion. Disturbance of the natural vegetation cover – usually as a result of development activities – has led to excessive erosion within many watersheds and along stream corridors. Increased erosion in the watersheds has led to problems of excess sedimentation in downstream estuaries, causing the infilling of stream channels, bays and coastal lagoons.

Vernal pool habitat in Southern California has been reduced by approximately 90 percent. Vernal pools are a wetland type unique to Mediterranean climates, and in Southern California are found primarily in San Diego and Santa Barbara Counties. Vernal pools are dependent on runoff from

surrounding uplands for their water. Thus, vernal pools have been lost due to both direct impacts to the pools, and indirect changes to the hydrology of surrounding upland areas.

Key Strategies and Priorities

The Wetlands Recovery Project has identified several considerations to help focus its work in coastal watersheds. High priority areas include: 1) areas where humans activities in the watershed are significantly impacting downstream coastal wetlands or other coastal resources; 2) stream corridors that provide connections to upland habitat areas; and 3) stream corridors that provide existing or potential anadromous fish habitat (e.g., for steelhead). The WRP will focus on preserving and restoring aquatic and riparian habitat, and re-establishing ecosystem functions such as hydrologic processes (including groundwater recharge and buffering of flood waters), erosion control and sediment transport, and water quality polishing.

- A. Preserve and restore riparian and aquatic habitat along stream corridors. Key restoration activities include removing exotic species and revegetating with native species, removing fish passage barriers, stabilizing creek banks and channels through environmentally-sensitive measures, replacing concrete and other hardscaping with biotechnical flood control and stabilization mechanisms, and “daylighting” creeks. The WRP will also encourage landowners to implement practices that preserve and protect stream corridors.
- B. Reconnect creek and river corridors to their floodplains. Floodplains perform many important ecosystem functions in a watershed, including supporting riparian habitat, detaining flood waters to slow and reduce flood peaks, and facilitating groundwater recharge. Opportunities in Southern California to reconnect creeks and rivers to their floodplains are very limited due to the encroachment of development. For this reason, preserving systems with intact floodplains and areas where floodplains can be re-established are high priorities for the WRP.
- C. Restore sediment transport functions. As described above, sediment transport functions have been altered in several ways. Restoration activities could include removing dams and other barriers to sediment transport, controlling erosion through environmentally-sensitive bank and channel stabilization measures, trapping sediment, and removing excess sediment in downstream estuaries. Specific priorities must be set individually for each watershed.
- D. Address water quality issues. Several of the strategies discussed above will have beneficial impacts on water quality by reducing sediment flows, contaminant loads, and water temperatures, and detaining floodwaters. Constructed treatment wetlands can be used as a bioremediation tool for improving water quality. Projects that achieve both water quality improvements and create new wetland habitat are possible. Additional measures such as sediment detention basins may be needed to reduce the impacts of nutrients and toxic constituents on downstream wetlands.
- E. Preserve and restore wetlands, particularly vernal pools, in coastal watersheds. As discussed above, both the vernal pool and its supporting upland area must be preserved to ensure survival of the pool.

Goal 3: Recover habitat and species diversity.***Statement of Need***

As a result of the region's extensive development, the region's coastal wetland habitats and wetland-dependent species have declined sharply from historical ranges and some have completely disappeared. Over 90 species of concern rely on Southern California's coastal wetlands for breeding and foraging habitat, and many more species of concern are found in the coastal watersheds.

The biological diversity of Southern California's coastal wetlands and watersheds has been affected on several different scales. On a regional scale, there have been significant losses of all types of habitat as a result of agricultural and urban development, with tidal wetlands and lower riverine habitat affected the most severely. Diversity of habitat types within individual wetlands has also suffered as portions have been filled or degraded. One of the most significant losses of habitat diversity has been the connections between wetland habitats and surrounding upland and dune habitats.

Species diversity is highly dependent on habitat diversity, and similar patterns of impact are seen. For instance, many species that rely on tidal wetlands have declined in numbers and are now species of concern. Species that depend on multiple habitat types for different activities or different life stages have also declined. Vernal pools contribute significantly to regional biodiversity. Several species that depend on these pools are now listed as species of concern. Natural habitat areas in Southern California are now highly fragmented, and linkages between habitat areas are critical for species requiring larger ranges and access to a diversity of habitat types. Linkages are also critical for supporting multiple populations of species, which in turn helps to maintain genetic diversity.

Species abundance is also an issue of concern. Extensive habitat modification has greatly reduced the carrying capacity of the regional ecosystem.

Key Strategies and Priorities

The efforts of the WRP to preserve and restore coastal wetlands and stream corridors in coastal watersheds are largely aimed at preserving and recovering the region's biodiversity. Significant changes to the natural landscape and the related reduction in the carrying capacity of the regional ecosystem limit the extent to which historic habitat and species conditions can be restored. Therefore, the WRP will focus its efforts on: 1) restoring fully functioning wetlands systems with a diversity of habitat types and connections to upland communities; and 2) preserving and recovering self-sustaining populations of species. Key strategies for accomplishing these goals include:

- A. Restore a diversity of habitat types within individual wetlands (where appropriate and feasible). Larger wetlands will best be able to sustain a diversity of habitat types.
- B. Employ a multi-species approach to wetlands recovery. The WRP advocates a multiple-species approach to wetlands recovery that also recognizes the more imminent threat to listed species. In general, this approach focuses on biological diversity at the ecosystem and habitat

level, rather than the species level. Listed species will continue to receive special attention; however, the objective is to maximize diversity and abundance of both listed and non-listed species.

- C. Preserve and restore vernal pool habitat.
- D. Preserve and restore surrounding upland and dune habitat.
- E. Preserve and restore habitat linkages and fish and wildlife corridors. This includes linkages from the coastal wetlands up into the watersheds, as well as between wetlands along the coast.

Goal 4: Advance the science of wetlands restoration in Southern California.

Statement of Need

Advancing the understanding of wetlands restoration science and incorporating this new knowledge into project designs are critical for the long-term success of wetlands recovery efforts in Southern California. As the science advances, the efficacy and cost-effectiveness of restoration efforts will improve. By investing in a greater understanding of restoration science now, the WRP will save far more money in the future.

Wetlands restoration is a relatively new practice, and much remains to be learned about the design and implementation of successful restoration projects. Research on coastal wetlands ecology and restoration has generally been focused on wetlands found along the east and gulf coasts. Information that is specific to the unique geologic and hydrologic conditions found in Southern California is needed. The WRP Science Advisory Panel has placed a high priority on research regarding the ecology of restoration sites in Southern California, as well as the restoration techniques that will optimize results. One priority identified by the WRP Science Advisory Panel is to develop and evaluate better restoration practices including, but not limited to, the physical design of restoration projects and techniques for promoting plant establishment.

Monitoring is a critical tool for evaluating both individual restoration projects and the health of the regional ecosystem. Currently, most monitoring for wetlands restoration projects is driven by permit requirements, and may not adequately evaluate ecological development of the system. In addition, few monitoring protocols are standardized throughout the region, and there is no system for sharing or disseminating monitoring data and findings. The goal in designing monitoring programs is to gather the most useful information within a limited budget. Additional research into monitoring protocols and appropriate indicators (such as edge and indicator species) could increase the cost-effectiveness of monitoring.

Key Strategies and Priorities

- A. Promote research on wetland ecology and restoration science, as well as on issues affecting the success of wetland restoration in Southern California. The WRP will promote wetlands restoration research in two main ways. First, the WRP will work with researchers to integrate

wetlands restoration research into WRP projects, similar to what was done at the Tijuana Estuary Model Marsh. Second, the WRP will develop an extramurally-funded research program on wetland ecology and restoration science through Science Advisory Panel.

- B. Promote development of more effective monitoring programs for both regional and project-specific assessments. The WRP will promote the development of better monitoring programs by requiring *and funding* monitoring programs for WRP projects. The WRP will also pursue development standardized monitoring guidelines and more cost-efficient monitoring techniques (See also Research and Management Needs, below).
- C. Disseminate Information. Through its network of federal, state, and local partners, the WRP will serve as a clearinghouse for information about wetlands research and restoration practices. Monitoring data from WRP projects will be made available on the WRP web site. In addition, the WRP will create forums for sharing research findings and recommendations.

Goal 5: Promote education and compatible access related to coastal wetlands and watersheds.

Statement of Need

Recovery of Southern California coastal wetlands and coastal watersheds cannot be achieved by a single agency or even a group of agencies. It can only be realized with the sustained support and commitment of the region's communities. Education is a critical tool for building this support and achieving long-term success. Communities will only be committed to preserving and restoring their wetland and watershed resources if they understand their ecological, economic, and aesthetic value.

Education about coastal wetlands and coastal watersheds must be targeted at the decision-makers of both today and tomorrow – that is, at both adults and children. Education efforts must also be targeted to reach key ethnic communities found in Southern California. For all communities and ages, the most effective education will be through first-hand experience of the resources. Thus, there is a great need to incorporate public access, interpretive programs, and opportunities for experiential learning into wetlands and watershed projects. Public access, however, must be structured in a way that is compatible with wetland resources.

Key Strategies and Priorities

- A. Develop compatible public access opportunities. Public access must be designed in a way that is compatible with the overall habitat goals of wetlands recovery efforts. In general, compatible access to wetland and watershed resources should be located around the edges of habitat areas to leave large areas in the middle undisturbed by human presence. Seasonal restrictions on access may be needed to adequately protect species during critical life stages. Access limitations may vary with user groups; for instance, a group of volunteers working on removal of exotic plants could have a greater level of access than a group of school children on a field trip. Even restrictions on access provide opportunities for learning if properly explained through interpretive signs. Areas where access is restricted in order to protect a

sensitive species or a re-establishing habitat can highlight the fragility of the system and the need for cooperative efforts to protect it.

- B. Integrate interpretive programs into wetlands and watershed projects. Interpretive signs at viewing areas and along access trails are a simple way to promote wetlands education. The WRP will encourage and fund the installation of interpretive signs and development of other interpretive materials as part of restoration projects.
- C. Continue to target the WRP Small Grants Program to projects with a significant community involvement or education element.
- D. Promote opportunities for experiential learning. Experiential learning opportunities include hands-on projects related to wetlands and watershed resources. Common examples include citizen monitoring programs, creek clean-ups, and volunteer work brigades to remove invasive plants or plant native species.
- E. Promote development of educational materials and activities related to coastal wetlands and coastal watersheds. The Education subcommittee of the Public Advisory Committee will continue to produce materials and sponsor activities that describe the values of wetlands and watersheds to targeted audiences.

Goal 6: Integrate wetlands recovery with other public objectives.

Statement of Need

Wetlands recovery efforts should be integrated with efforts to achieve other public objectives such as flood management, water quality improvements, beach nourishment, groundwater recharge, and recreation. Without an integrated approach, efforts to achieve these other public objectives may frustrate wetland recovery efforts. For example in many watersheds in Southern California, flood management efforts have worked at odds with wetland recovery objectives. Channelization of waterways and removal of riparian habitat are common flood control practices throughout the region. These practices continue in the rapidly urbanizing areas of the region, despite efforts in older areas to restore creek and river corridors and take a more integrated approach to flood control.

Key Strategies and Priorities

- A. Promote integration of wetlands conservation planning and priorities into related public policies and projects. Many of the federal, state and local agencies that are responsible for pursuing or regulating the other public objectives listed above are participants in the Wetlands Recovery Project. The WRP will use these agency connections to promote a more integrated approach to achieving multiple public objectives. A key strategy is including consideration of wetlands issues and wetlands objectives in planning and policy documents for other types of projects. Key public objectives that relate to WRP efforts include:
 - Flood management
 - Water quality improvements

- Recreation
 - Fire suppression measures
 - Public safety
 - Landscaping of public property
- B. Promote wetlands projects with multiple objectives. The WRP will place priority on wetlands and watershed projects that achieve public objectives in addition to habitat objectives. Types of wetlands and watershed projects that could facilitate other such public objectives are outlined below. Several of these strategies are discussed in greater detail under Goals 1-5.
- Flood Management:
 - o Reconnect creek and river corridors to their floodplains. As discussed under Goal 2, reconnecting creek and river corridors to their floodplains will not only provide additional storage capacity for flood waters, it will also increase riparian and aquatic habitat, facilitate groundwater recharge, and improve water quality by reducing erosion and sedimentation.
 - o Restore or create wetlands adjacent to stream corridors. Similar to floodplains, these wetlands can be designed to provide additional storage capacity for floodwaters.
 - o Promote vegetation management practices that achieve both flood control and habitat objectives.
 - Water Quality
 - o Create treatment wetlands. Treatment wetlands can be designed to remove specific constituents from water such as nutrients, metals, or bacteria. These are *new* wetlands created in upland areas. Although water quality objectives will be paramount in these projects, habitat objectives can also be achieved.
 - o Restore watershed ecological functions. Almost all of the strategies discussed under Goal 2 will also benefit water quality. These include restoring stream corridors, reconnecting waterways with their floodplains, restoring sediment transport functions, and preserving and restoring wetlands habitat.
 - Beach Nourishment
 - o Promote nearshore disposal of sediments. Several wetland sites in Southern California will require significant removal of sediments as part of any future restoration. Disposal of these sediments in the nearshore waters would facilitate sand replenishment on area beaches. The WRP will work with state and federal partners to develop protocols for nearshore disposal of sediments that both protects water quality and maximizes beach nourishment impacts.
 - o Remove barriers to sediment transport.
 - Recreation and Access
 - o Provide compatible access and recreation opportunities. As discussed under Goal 5, the WRP wants to promote compatible access to wetland and watershed resources. It must be recognized that in Southern California natural habitats are

limited not only for birds and wildlife, but also for people. Southern California's coastal wetlands and watersheds provide areas of calm in the hectic urban landscape. The WRP is committed to the idea that through compatible access measures, humans and wildlife can successfully share these remaining pieces of nature.

B. Subregional Priorities

For each County, the Wetlands Recovery Project has identified more specific priorities for preserving and restoring coastal wetlands and watersheds. These priorities include both types of actions (e.g., increasing tidal connections or reducing erosion in the watersheds) and specific targeted locations. Where appropriate, specific objectives related to the other four regional goals have also been identified.

PLEASE NOTE: These subregional objectives are a very preliminary draft provided as a starting point for discussion. The Wetlands Managers Group intends to work with each of the 5 county task forces to develop these in greater detail and ensure that they accurately reflect local priorities, as well as state and federal priorities.

1. San Diego County

Coastal Wetlands

Over one-third of the remaining coastal wetland acreage is located in San Diego County. The majority of the wetlands acreage is already in public (or conservation) ownership; therefore, WRP preservation efforts will focus on acquisition of adjacent transitional and upland habitats that support the wetland ecosystems. WRP priorities for restoration of coastal wetlands in San Diego County include:

- Complete the 500-acre, multi-phased Tijuana Estuary Tidal Restoration Program.
- Restore and enhance the South San Diego Bay wetlands in accordance with the restoration plan being developed by the U.S. Fish and Wildlife Service.
- Restore and enhance the north county lagoons. Key issues to be addressed include habitat diversity and distribution; improved tidal connections and circulation; control and removal of invasive species; reduction of sediment, nutrient, and contaminant inputs from the watersheds; and development of long-term management plans and funding mechanisms.

The Santa Margarita River estuary lies within the Camp Pendleton U.S. Marine Corps (USMC) base. The WRP will work with the USMC to preserve and restore these wetlands.

Coastal Watersheds

In San Diego County, the WRP's work in coastal watersheds will focus initially on watersheds with adverse impacts on downstream wetlands or other coastal resources, and on preserving

stream corridors that support substantial riparian and aquatic habitat or serve as a linkage between habitat areas. Watersheds with significant impacts on coastal wetlands include the Tijuana River, Otay River, Los Peñasquitos Creek, Escondido Creek, and Buena Vista Creek. Key concerns in these watersheds include increased erosion, invasive species, and degraded water quality.

Priority stream corridors for the WRP for preservation of riparian and aquatic habitat include the Tijuana River, Otay River, Los Peñasquitos Creek, San Luis Rey River, and Santa Margarita River. The Santa Margarita River is the least disturbed watershed south of Point Conception and supports high quality aquatic and riparian habitat. The lower portion of this watershed lies within Camp Pendleton. Therefore, the WRP will work with the USMC to preserve and enhance the lower watershed, while actively pursuing opportunities in the upper watershed. Stream corridors that serve as key linkages between habitat areas include the Tijuana River, Otay River, and the Santa Margarita River.

Steelhead trout were recently identified in San Mateo Creek, which lies on the border between San Diego and Orange counties. The lower portion of this watershed is within Camp Pendleton. Activities in this watershed will focus on the potential for restoring a steelhead run to this creek.

Research and Education

Tijuana Estuary has been designated a National Estuarine Research Reserve (NERR) by NOAA under the Coastal Zone Management Act. Each NERR is viewed as a "living laboratory" in which scientists conduct research and educators communicate research results. For this reason, it will be a priority for the WRP to integrate wetlands restoration research studies into projects implemented in Tijuana Estuary.

2. Orange County

Coastal Wetlands

Preservation and restoration of coastal wetlands in Orange County will focus on the string of wetlands in the north county from Upper Newport Bay to Los Cerritos Wetlands. Three of these wetlands – the Santa Ana River Estuary, Huntington Beach Wetlands, and Los Cerritos Wetlands* – are primarily privately owned. Acquisition of these sites from willing sellers is a high priority for the WRP. Upper Newport Bay and Anaheim Bay support relatively healthy estuarine systems. Efforts at these sites will focus on addressing impacts from the watersheds, including inputs of sediment, nutrients, and contaminants. The other coastal wetlands in the north county are degraded to varying degrees and will require restoration. Restoration efforts will initially focus on Bolsa Chica wetlands. Restoration of the Santa Ana River Estuary, Huntington Beach Wetlands, and Los Cerritos Wetlands will begin once these sites (or portions of them) are acquired.

In southern Orange County, the coast is much steeper and supports only a few small coastal wetlands. Additional information is needed about these small wetlands in order to set specific priorities for coastal wetlands in the south county.

* The Los Cerritos Wetlands is divided between Orange and Los Angeles Counties.

Coastal Watersheds

The watersheds in Orange County differ markedly between the southern and northern halves of the county. Southern Orange County is characterized by several short, steep watersheds with only partially modified stream corridors. Northern Orange County is drained by two large river systems – the Santa Ana and San Gabriel Rivers* – and the smaller San Diego Creek. These three systems have been heavily engineered with large portions of the Santa Ana and San Gabriel Rivers completely encased in concrete. The WRP’s objectives for coastal watersheds in Orange County reflect these differences.

Restoration opportunities along the lower Santa Ana and San Gabriel Rivers are limited since the rivers flow through concrete channels. In the lower watersheds of these rivers, WRP efforts will focus on restoring or recreating wetlands habitat adjacent to the river channels. Along the Santa Ana River, one priority is to restore a continuum of wetland habitats from tidal salt marsh to riparian along the lower three miles of the river. For San Diego Creek, priorities include reducing the input of sediment, nutrients, and contaminants to Upper Newport Bay through environmentally-sensitive measures; and preserving and restoring aquatic and riparian habitat along the creek, particularly where it links upland habitat areas.

In southern Orange County, the WRP will focus on addressing the impacts of urban development on the stream corridors, including increased storm flows, increased erosion, invasive species, and degraded water quality. Proactive action on these creeks now will be far more cost-effective than trying to restore them after further degradation.

3. Los Angeles County

Coastal Wetlands

Los Angeles County has lost over 90 percent of its coastal wetlands, a greater percentage than any other county in the region. Most of this loss occurred within the Los Angeles basin. For this reason, preservation and restoration of coastal wetlands habitat within the Los Angeles basin is a very high priority for the WRP. Within the basin, only two significant coastal wetland areas remain: the Los Cerritos wetlands complex, and the wetlands and lagoons near the mouth of Ballona Creek. Large portions of both these sites are privately owned; therefore, acquisition of Los Cerritos and Ballona wetlands from willing sellers is a priority for the WRP. Once acquired, restoration and enhancement of these sites would be the next step.

There are a few coastal lagoons and wetlands in the Santa Monica Mountains region, the largest being Malibu Lagoon. Although most of the existing wetland habitat at these sites is publicly-owned, acquisition of adjacent properties would enable expansion of wetland habitat. This is a priority, particularly at Malibu Lagoon. Another key issue for these coastal wetlands is addressing the impacts of sediment, nutrient, and contaminant inputs from the watersheds.

* The San Gabriel River also drains portions of Los Angeles County.

Coastal Watersheds

Coastal watersheds in Los Angeles County differ distinctly between the LA basin and the Santa Monica Mountains region. The LA basin is drained by four main waterways – the San Gabriel River, Los Angeles River, Dominguez Channel, and Ballona Creek. The lower portions of all four of these waterways are confined to concrete channels. For this reason, restoration opportunities in the lower watersheds will focus on restoring or recreating wetlands habitat adjacent to the river channels. In the upper watersheds, there are more opportunities for preserving and enhancing existing habitat.

In contrast to the LA basin, the Santa Monica Mountains contains several short, steep drainages most of which are in a fairly natural state. In this region, the WRP priorities include: watersheds adversely impacting downstream wetlands or other coastal resources; existing or potential steelhead streams; and systems with substantial aquatic or riparian habitat. Watersheds with significant impacts on coastal wetlands include Topanga, Malibu, and Trancas Creeks. Key concerns in these watersheds include increased erosion, invasive species, and degraded water quality. Key streams for steelhead restoration include Solstice Creek, Malibu Creek, and Topanga Creek. Additional information is needed regarding riparian and aquatic habitat along Santa Monica Mountain stream corridors in order to identify specific priorities for habitat preservation and restoration.

4. Ventura County

Coastal Wetlands

Preservation and restoration of coastal wetlands in Ventura County will focus on the Ormond Beach wetlands, Mugu Lagoon, and the Santa Clara and Ventura River estuaries. One high priority is to acquire and/or preserve the Ormond Beach wetlands area. Subsequently, a restoration plan for the area will be developed and implemented. Mugu Lagoon, one of the largest and healthiest tidal wetlands on the south coast, lies completely within the Point Mugu Naval Station, limiting opportunities to undertake enhancement projects. Therefore, the WRP will focus on addressing upstream impacts to the lagoon, such as inputs of sediment, nutrients, and contaminants from Calleguas Creek.

Coastal Watersheds

Ventura County is dominated by three large coastal drainages – Calleguas Creek, the Santa Clara River, and the Ventura River. Comprehensive watershed management plans have been developed for Calleguas Creek and the Santa Clara River. The WRP will use these plans to help set priorities for these two watersheds. All three of the main river systems in Ventura County remain in a relatively natural state, providing many opportunities for preserving and restoring the stream corridors. A key objective will be to reconnect these waterways to their floodplains. This can be accomplished through acquisition of adjacent property and relocating the confining levees to widen the stream corridor. Comprehensive programs to control and remove invasive species from the watersheds, particularly *Arundo*, are also needed. The Ventura and Santa Clara Rivers, as well as some of the smaller drainages in the county, provide habitat for steelhead trout. Restoring steelhead habitat and removing passage barriers along these waterways is a priority for the WRP.

5. Santa Barbara County

Coastal Wetlands

Preservation and restoration of coastal wetlands in southern Santa Barbara County will initially focus on Carpinteria Salt Marsh, Goleta Slough, Devereux Slough, and coastal vernal pool habitat. Carpinteria Salt Marsh, Goleta Slough, and Devereux Slough are primarily in public ownership. Therefore, WRP efforts will focus on restoration and enhancement of wetlands habitat, as well as acquisition of surrounding upland habitat and connecting riparian habitat. Re-establishing hydrologic processes is critical to restoration at all of these sites. Addressing watershed impacts, particularly at Goleta Slough and Carpinteria Salt Marsh, is also a priority. Several coastal vernal pool sites in Santa Barbara remain in private ownership. WRP efforts will initially focus on preservation of these sites, followed by restoration and enhancement. Additional information about smaller canyon mouth wetlands in the County is needed in order to develop more specific priorities for those wetlands.

Coastal Watersheds

Santa Barbara County south of Point Conception is characterized by short, steep watersheds. There are no large river systems in this portion of the County. Many of the stream corridors have been somewhat modified or otherwise impacted by urban and agricultural development; however, for the most part the streams have not been confined to concrete channels. Thus, even in engineered channels there are significant opportunities for habitat restoration and enhancement.

WRP efforts will focus on three main areas:

- Preserving functioning stream corridors, in part by encouraging landowners, the cities, and County to take proactive measures to protect streams from the impacts of continued development.
- Restoring and enhancing stream corridors. Key concerns include reducing bank and channel erosion, removing invasive species, and re-establishing riparian vegetation.
- Removing steelhead passage barriers and re-establishing steelhead runs in historic steelhead creeks.

Research and Education

There are many possibilities for creating research and/or education opportunities between the WRP and University of California at Santa Barbara. U.C. staff manage all or portions of Goleta Slough, UCSB Campus Lagoon, Devereux Slough, and Carpinteria Salt Marsh. The WRP will work with U.C. researchers to integrate wetlands research and education programs into restoration efforts at these and other sites in the County.

C. Research and Management Needs

There are many gaps in our knowledge about the ecology of Southern California's coastal wetlands and watersheds, as well wetland restoration techniques appropriate for the region. The WRP Science Advisory Panel has identified three areas for which additional data and research is needed:

- Prioritizing Wetlands Acquisition and Restoration Projects
- Addressing Constraints to Restoration Projects
- Optimizing Restoration Implementation and Evaluation

Data and research priorities for each of these functions are discussed below.

Prioritizing Wetlands Acquisition and Restoration Projects

Wetlands acquisition and restoration projects are prioritized based on the degree to which they further the WRP's goals. The goals outlined in this Regional Strategy are fairly broad, leading to a qualitative assessment of each project's benefits based largely on professional judgement. At this time, there is insufficient understanding about the historic and existing conditions to set more specific quantitative restoration objectives broken out by sub-region or wetland habitat type. The Science Advisory Panel has identified the need to provide the WRP with an analytical framework for prioritizing acquisition and restoration projects based on ecological benefits to the region^[MS1]. Several options for analytical tools are now under consideration. Key data and research priorities include:

- Estimate of historical quantity and distribution of wetland habitat types.
- Estimate of current extent and distribution of wetlands habitat types. The Southern California Coastal Wetlands Inventory compiled acreage data on existing wetlands habitat types for the major coastal wetlands in the region. The Inventory did not compile spatial data on habitat types. No estimates of riparian habitat for the region have been made.

With a clearer picture of existing and historical conditions, it will be possible to set more specific, perhaps even quantitative, goals for the recovery of coastal wetlands and stream corridors in coastal watersheds.

Addressing Constraints to Restoration Projects

Wetlands restoration projects in Southern California take place in a highly complex urban environment. The effects of these urban surroundings on water and sediment quality can constrain the ability of the WRP to implement projects. Further research is needed to assess the scientific basis of these constraints, identify the circumstances under which they are most likely to be important, and identify how they should be addressed in project designs to ensure the WRP's long-term success. Key areas for further research and data collection include:

- Identify the most common and difficult impediments to wetlands restoration.
- Evaluate the role of marshes in nearshore public health issues, including, but not limited to, bacteria, viruses, pathogens, and mosquitoes.
- Evaluate the effects of watershed sediment dynamics and sediment management practices on the health of coastal marshes.

- Evaluate the role and function of coastal wetlands in urban runoff control and management.
- Evaluate the effects of natural and anthropogenic changes to water level, tidal exchange, and shoreline stability on coastal wetlands.

Improving Restoration Implementation and Evaluation

Restoration of coastal wetlands and riparian corridors is a relatively new practice, and there is still much to be learned about the design and implementation of successful restoration projects. Every project provides opportunities for increasing our understanding of key ecological processes and beneficial restoration techniques which will improve the success of future restoration efforts. Effective monitoring is a critical tool for capitalizing on these opportunities. Key areas for further research and data collection include:

- Develop and evaluate better restoration techniques including, but not limited to, the physical design of restoration projects and techniques for promoting plant establishment.
- Define success criteria for individual projects, and identify elements to monitor in order to be able to evaluate projects based on those criteria.
- Define and test performance curves for assessing restoration progress and success.
- Test and implement a region-wide monitoring program.
- Identify important edge species that can serve as indicators of success of restoration and evaluate their habitat requirements.